Agilent Technologies

Agilent Technologies 914A and 914B Moving Loads

Operating and Service Manual

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Warranty

Custom systems are warranted by contractual agreement between Agilent Technologies and the customer.

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Agilent Technologies, Inc., certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

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This Agilent Technologies system product is warranted against defects in materials and workmanship for a period corresponding to the individual warranty periods of its component products. Instruments are warranted for a period of one year. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

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Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For assistance, call your local Agilent Technologies Sales and Service Office (refer to "Service and Support" on page vi).

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:
`http://www.agilent.com/find/assist`

Click on "Contact Us" and select your country.

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

United States:	(800) 403-0801
Canada:	(877) 429-9969
Europe:	(41 22) 780.6111 (Switzerland) (33 1) 69 82 66 66 (France) (49 7031) 464-6222 (Germany) (44 188) 9696622 (Great Britain)
Japan:	0120-32-0119
Latin America:	(11) 7297-3700 (Brazil)
Australia/New Zealand:	1-800-802-540 (Australia) 0800-738-378 (New Zealand)
Asia-Pacific:	080-047-669

Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

WARNING

The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Overview

Description

The Agilent 914A and 914B moving load consists of a section of waveguide which is mounted in a tapered, low-reflection load. By means of a plunger, the load may be moved longitudinally in the waveguide at least 1/2 wavelength at the lowest waveguide frequency. Since reflections from the load can occur in any phase by moving the load, at a single frequency the reflection from the load can be separated from those caused by a discontinuity in the transmission system.

The difference between the 914A and 914B is the waveguide section. The 914A section is standard waveguide stock. The waveguide section of the 914B is a precision machined waveguide section which is held at very close tolerance.

Uses

For single and swept-frequency transmission and reflection measurements a moving load is a convenient means of determining how much of a SWR is due to the termination. Use of the 914 for swept-frequency attenuation, impedance and directivity measurements is described in *Agilent Application Note 183, High Frequency Swept Techniques*. Copies of this Note are available from the Agilent Technologies Sales and Service Offices.

CAUTION

Use the knob on the shaft to move the load forward and backward only. Do not rotate this knob, as this will loosen the load and damage your 914A/B.

The thumbscrew should be rotated to lock the load in place, or to unlock it prior to moving the load.

Preventive Maintenance

Protect the face of the coupling flange from damage. Any scoring or burring of the mating surfaces causes discontinuity; the resulting increase in SWR degrades performance. The protective cap part number is 5040-0354.

Specifications

Table 1 Agilent X914A/B Specifications

Characteristic	Value
Frequency Range	8.20 to 12.4 (GHz)
Waveguide ID (in) Tolerance	0.900x0.400 in ±0.001
Waveguide Size (EIA)	WR90
Equivalent Flange	UG135/U
SWR Load (max.)	1.01
SWR Waveguide (max.)	1.005
Power Rating	1 W
Dimensions (Length)[1]	10.125 in (257 mm)
Weight	.875 lbs (0.4 kg)

1. Nominal length with shaft fully extended.

Load Replacement

The replacement load for the X914A is as follows:

- Load 5020-3206

The load is mounted on the end of the plunger. Place unit in upright position and carefully remove four screws holding load section. Carefully withdraw entire assembly from the guide. Unscrew old load and replace.

CAUTION

Handle with care. Be careful when inserting assembly not to touch the load tip to the sides of the waveguide section.

Performance Test

Do the following performance tests for incoming inspection, after repair, or any other time the performance of the load is suspect. The SWR is measured by measuring the reflection coefficient, The SWR is related t o the reflection coefficient (ρ) by the expression:

$$SWR = 1 + [\rho] / 1 - [\rho]$$

Fixed Frequency Reflection Coefficients

Connect the equipment as shown in Figure 1. External ALC operation is not essential. The 20 dB coupler and detector #1 may be eliminated without degrading results. Refer also to Table 2.

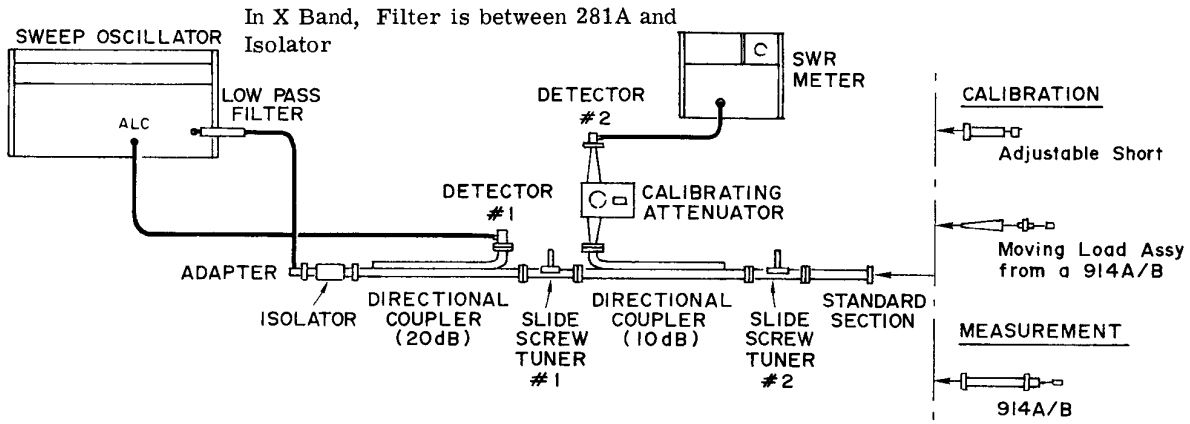

Figure 1 Reflection Coefficient Setup

Table 2 Equipment Required for Reflection Coefficient Measurement

Measurement Frequencies (GHz)	Sweep OSC	Low Pass Filter	Isolator
8.20 and 12.4 GHz	8690B-8694B	X362A	I-155L

Calibration

Set the sweep oscillator for CW output at lowest frequency. Internal-squarewave modulate the output at 1000 Hz. Connect adjustable short to standard section. Tune slide-screw tuner #1 so SWR meter reading is less than 1.02 SWR as adjustable short is moved.

Remove adjustable short and insert moving load (with defective load) into standard section. Phase load for maximum reading on SWR meter. Tune slide-screw tuner #2 for a minimum reading on SWR meter(-60 dB RANGE). Phase (move) the load for a maximum reading on the SWR meter and adjust the gain for a reading of 0 dB on the SWR meter scale. Tune slide-screw tuner #2 spindle only for a reading of a loss of 6 dB. Phase load and readjust slide-screw tuner #2, if necessary, to obtain a maximum meter excursion of 0.2 dB as load is phased. Directivity signal is now below –79 dB.

Set calibrating attenuator to 40.0 dB and remove moving load from standard section. Reconnect adjustable short and set SWR meter RANGE and GAIN to a convenient meter reference. Move calibration attenuator from 35 to 50 dB and check the SWR meter response. Remove adjustable short and set calibrating attenuator to 0 dB.

NOTE

If necessary, insert an appropriate microwave amplifier between sweep oscillator output and low-pass filter for better resolution. If an amplifier is inserted, be sure to repeat the above calibration.

Return Loss Measurement

Connect 914A/B to be tested to standard section. Phase the load and measure the difference in dB between the minimum and maximum SWR, meter readings. Get corrections from Signal Separation Chart (Figure 2) and add them to the smallest dB reading. One of these figures is the body reflection and the other the load reflection. If it is necessary to identify these reflections, as when one figure meets specifications but the other does not, refer to the next paragraph.

Maximum Body Reflection	**–53.0 dB**
Maximum Load Reflection	**–46.7 dB**

The small error caused by the imperfectly-tuned-outdirectivity of the reverse coupler is allowed for in these test limits.

If it necessary to identify the reflections, temporarily increase the body reflection by placing a fibre washer or a small piece of wire into the 914 waveguide near the flange end. Repeat the measurements and use Figure 2 to separate the two signals.

CAUTION

Be sure to remove this added material when the test is completed.

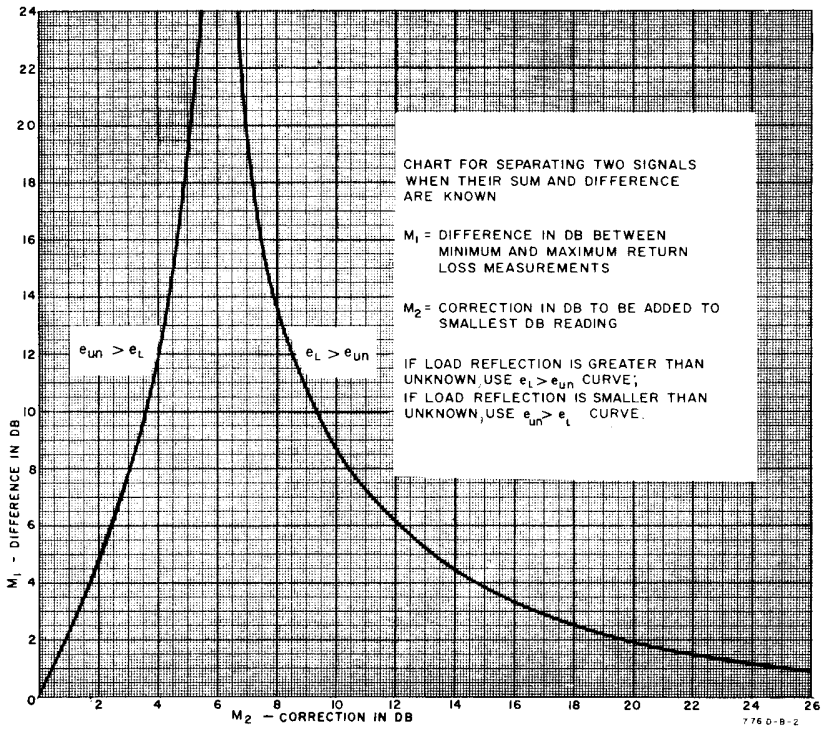
CHART FOR SEPARATING TWO SIGNALS WHEN THEIR SUM AND DIFFERENCE ARE KNOWN
M1 = DIFFERENCE IN DB BETWEEN MINIMUM AND MAXIMUM RETURN LOSS MEASUREMENTS
M2 = CORRECTION IN DB TO BE ADDED TO SMALLEST DB READING
IF LOAD REFLECTION IS GREATER THAN UNKNOWN, USE eL > eun CURVE; IF LOAD REFLECTION IS SMALLER THAN UNKNOWN, USE eun > eL CURVE.
eun > eL
eL > eun
M1 - DIFFERENCE IN DB
M2 - CORRECTION IN DB
0
2
4
6
8
10
12
14
16
18
20
22
24
26
776 D-B-2

Figure 2 Signal Separation Chart